

*Virginia Department of Education*



# **2017 Broadband Connectivity Capability Survey REPORT**



# Table of Contents

**Executive Summary**..... 5

**Introduction**..... 6

    K-12 Learning Infrastructure Program (KLIP) Goals

**Internet Access and Bandwidth** ..... 6

    Fiber Connectivity

    Bandwidth Goal

**Affordability** ..... 7

    The Schools and Libraries (E-rate) Program

**Barriers To Connectivity**..... 9

**Sufficiency of Wi-Fi Connections** ..... 11

**Number and Brand of Student Computing Devices** ..... 11

**Information Security** ..... 12

**Internet Outside of School** ..... 13

**Support for Digital Learning** ..... 14

**Conclusion** ..... 15

**Recommendations** ..... 15

    Homework Gap

    Broadband Data Collection Assistance

    E-rate

    Network Engineering Expertise

**Glossary of Terms** ..... 16

**Appendix A** ..... 19

    KLIP Survey

**Appendix B** ..... 23

    SETDA E-rate Document

**Special thanks to  
EducationSuperHighway  
for their support in  
developing the questions,  
data collection, analysis  
and reporting.**





## Executive Summary

To support greater broadband access for Virginia students, teachers and administrative staff, the Virginia Department of Education (VDOE) established the K-12 Learning Infrastructure Program (KLIP) in 2015. KLIP has made significant progress increasing broadband connectivity. Survey results combined with other information reveal that 99% of public school buildings in Virginia are now connected to high-speed fiber and 122 divisions of 132 are exceeding the minimum bandwidth goal set by the Federal Communications Commission (FCC) of 100 kbps per student. Additionally the cost of bandwidth for schools is becoming more affordable with bandwidth costs decreasing as school divisions increase the amount of bandwidth needed to support digital learning. Results indicate that Virginia's public school system is currently in a good position to provide classroom connectivity that supports digital learning and the Board of Education's Profile of a Virginia Graduate. However, challenges do remain.

To decrease costs school divisions have leveraged state contracts and other competitive measures to include building their own fiber networks using E-rate and the Virginia Public School Authority (VPSA). These efforts have saved substantial funds while increasing bandwidth. However results show that some Virginia school divisions where there may be only one Internet service provider still pay more for Internet access than their counterparts in other locations in the state where competition exists. Survey results also suggest a number of other activities and factors that will require continual diligence to routinely evaluate, support and upgrade bandwidth in schools to meet student needs. High level information shows that there are almost 1 million mobile devices across all public school divisions in Virginia. These mobile devices are being deployed to support one-to-one programs so that students can access educational content targeted to their needs.

Information security is a concern as well for school technology directors. The findings show that 53 divisions or 40% need additional personnel to support information security. In addition, 82 divisions reported they had never had an information security audit. School divisions in Virginia are also implementing digital and web-based learning programs requiring students to work and collaborate on assignments not only at school but also outside of the classroom. However the results also confirm that a large number of low-income and rural students are finding themselves caught in the "Homework Gap" and struggling to keep up due to a lack of home broadband connectivity. Ninety-two divisions indicated the lack of Internet access outside of school is either "Very" or "Somewhat" limiting.

To continue building upon the broadband successes of Virginia's school divisions and the KLIP program and to meet current and future needs, the VDOE recommends additional funding and support for divisions' broadband programs, a heightened focus on information security, ongoing analyses of the school broadband landscape, and a state-level stakeholder-driven strategy with recommendations for connectivity that supports digital learning.

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## Introduction

In 2015, the Virginia Department of Education (VDOE) initiated the **K-12 Learning Infrastructure Program** (KLIP) in partnership with the Office of the Governor, and the EducationSuperHighway (ESH). The KLIP program supports increased access to affordable, high-speed Internet in every classroom in Virginia. The goals of the KLIP also support Virginia's Profile of a Virginia Graduate.

### KLIP Goals:

1. *Get fiber to the schools that need it;*
2. *Ensure classrooms have updated and reliable Wi-Fi;*
3. *Help divisions secure more broadband for their budgets; and*
4. *Assist schools with the E-rate process to get the discounts they need for Internet access and internal connections*

In the 2016 Virginia Appropriation Act (Item 137.G), the General Assembly directed school divisions to report to the VDOE, by November 1 of each year, the status of broadband connectivity capability of schools in the division.

In response to the General Assembly directive, the VDOE collaborated with the ESH to develop the 2017 KLIP Broadband Connectivity Capability Survey. The data collected on Internet access, the first nine questions of the survey (Appendix A), was verified by school division technology leaders so that the information would be as accurate as possible. This was an important step because while the FCC Form 471 from the E-rate program data is the most comprehensive publicly available data, it can sometimes be ambiguous as a result of occasional errors on the Form. The VDOE also collected other broadband related data from school technology leaders to better understand the technology landscape in Virginia's public schools.

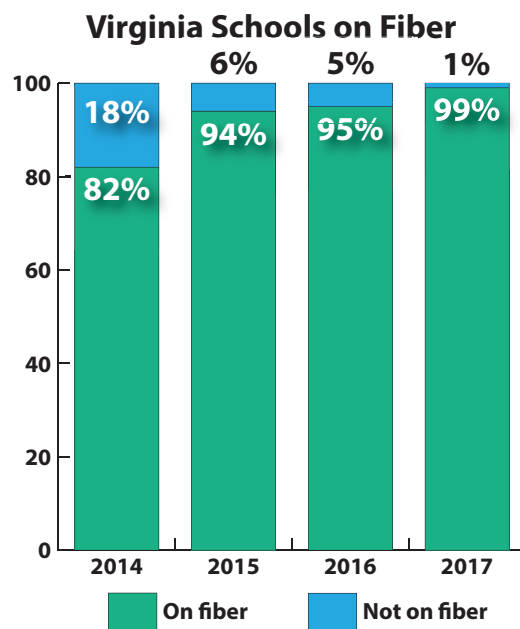
The data collection was open from July 2017 to October 2017. After extensive follow-up, all 132 school divisions completed the survey. However, not all school divisions responded to all questions. Divisions reported the following information for the 2017 school year:

- Internet Access and Bandwidth
- Affordability
- Barriers to Connectivity
- Number and Brand of Student Computing Devices (e.g. Chromebooks, tablets, laptops)
- Resources Needed to Support Digital Learning
- Information Security
- Internet Outside of School

## Internet Access and Bandwidth

### Fiber Connectivity

The network infrastructure in schools needs to keep pace with the digital learning challenges in K-12 and new opportunities for innovation. Network capabilities are critical to the K-12 mission today. This requires schools to have scalable fiber connections to the Internet. Fiber connections are very important because they allow schools to scale to extremely high bandwidth and this type of broadband is becoming increasingly more affordable.



*School buildings connected to fiber increased from 82% in 2014 to 99% in 2017*

*Source: EducationSuperHighway*

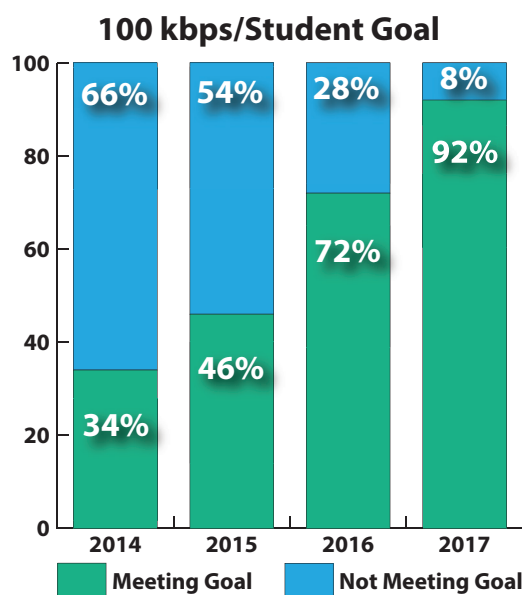
There is a total of 1,810 public school buildings in Virginia's public school system. The percentage of school buildings connected to fiber increased from 82% in 2014 to 99% in 2017. Today, only seven school buildings do not have a fiber connection. The schools not on fiber are in geographically remote locations where fiber is not available. The VDOE and the ESH have been working with the schools in divisions not on fiber to help them with strategy. The strategic approach is intended to research the viability and affordability of bringing fiber to school buildings in remote locations using E-rate funds and the Virginia Public School Authority (VPSA) matching funds. In some cases however, a school division may decide not to move forward with a fiber project because of the expense, limited number of students enrolled in the school, and because the existing technology is sufficient to serve the bandwidth needs of the school.

Once schools have a scalable, fiber connection to the Internet, it is essential that students, teachers, and staff, have enough bandwidth for digital learning. To help schools across the country assess how much bandwidth is sufficient to support digital learning, the Federal Communications Commission (FCC) adopted the State Education Technology Directors Association (SETDA) recommended connectivity target of 100 Megabit per second (Mbps) per 1,000 students in the short term and 1 Gigabit per second (Gbps) per 1,000 students in the long term. These targets were recommended in the SETDA publication, *The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs* ([http://www.setda.org/wp-content/uploads/2013/09/SETDA\\_BroadbandImperative\\_May20Final.pdf](http://www.setda.org/wp-content/uploads/2013/09/SETDA_BroadbandImperative_May20Final.pdf)). For the purposes of this Report, these bandwidth numbers were further broken down as 100 Mbps per 1,000 students which is equivalent to 100 Kilobits (Kbps) per second per student.

## Bandwidth Goal

Since 2015, an additional 777,768 students in 70 divisions upgraded to the goal. According to the ESH, the average bandwidth including all divisions statewide per student is 368 kbps. The median bandwidth including all divisions statewide per student is 216 kbps.

The need for additional bandwidth is ongoing as mobile computer devices such as Chromebooks are added to school networks. In addition, students and teachers are increasing the use of streaming video content and other bandwidth intensive technologies. Today the typical school division, in the median range, has over twice the FCC's 2014 minimum recommended amount of bandwidth.



*Today in Virginia, 122 divisions of 132 are exceeding the minimum bandwidth goal of 100 kbps per student.*

*Source: EducationSuperHighway*

In 2014, only 34% of school divisions met the FCC's minimum recommended goal of 100 kbps/student. In 2017, 92% of divisions met or exceeded this goal. This means that most students in Virginia's public schools currently have the bandwidth needed to access digital resources. The school divisions that are not at 100 kbps/student are currently working on upgrades.

## Affordability

- *School division technology leaders can use price transparency tools to negotiate lower costs for Internet access.*
- *As school divisions purchased larger amounts of bandwidth, the price per megabit decreased.*

In the 2014 **E-rate Modernization Order**, the FCC set forth three major goals of the E-rate program. One of the three major goals was to ensure affordable access to high-speed broadband sufficient to support digital learning in schools.

## The Schools and Libraries (E-rate) Program

E-rate is one of four Universal Service Fund (USF) programs supported by USF fees collected via telecommunications providers. The FCC's Universal Service for Schools and Libraries Program (often referred to as E-rate) is known as a "discount" program. The E-rate program provides subsidies on Internet access and internal connections based on the school division's free and reduced lunch numbers. The percentage of free and reduced lunch eligible students, along with the school division's geographical locale (urban or rural) is entered into a formula that calculates the E-rate discount. A division's E-rate discount can range anywhere from 20 percent to 90 percent. The program is currently capped at \$3.9 billion.

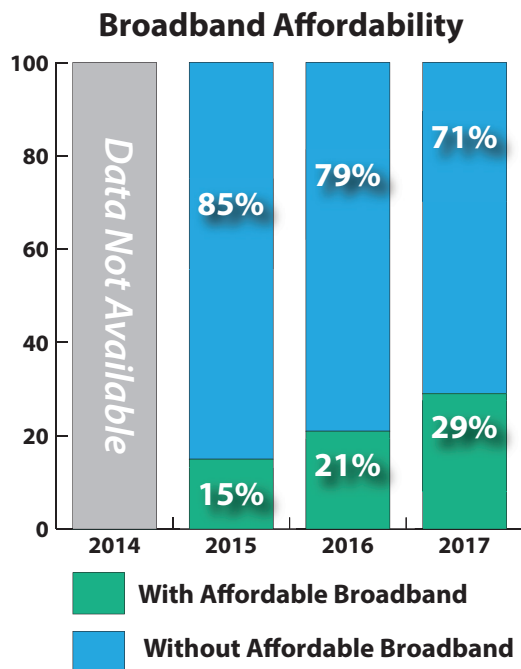
Authorized under the Telecommunications Act of 1996, E-rate's authors focused the program on connecting all schools and libraries to the Internet. Since the FCC's 2014 E-rate Modernization Order, the E-rate's goal is to ensure that all schools and libraries have ample bandwidth to meet the educational needs of students and library patrons. To accomplish this goal, E-rate provides public and private schools and public libraries with support for category one services which include internet access and data transport (Wide Area Networks) between school facilities. Discounts are provided as a percent of total eligible project costs. E-rate also provides support for category two funding which includes internal connections and managed internal broadband services (Wi-Fi).



Discount maximums are determined by school enrollment and poverty level.

The Compare and Connect K-12 (CCK-12) tool (<http://www.compareandconnectk12.org>) developed by ESH, provides price transparency to schools and Internet service providers and reveals the going rate for broadband. Because the CCK-12 tool was available, some school divisions in Virginia were able to compare the cost they pay for broadband to another school division or multiple divisions in the same geographic area. The CCK-12 tool was one resource that division technology directors used to further negotiate better pricing for Internet access. In addition, as school divisions purchased larger amounts of bandwidth, the price per megabit decreased.

This metric compares the amount of bandwidth school divisions currently receive to the amount they could receive if those same funds were used to purchase Internet access at 2015 national benchmark prices. For more information about affordability benchmarks, please see the EducationSuperHighway's 2017 State of the States Report (<http://stateofthestates.educationsuperhighway.org/?postalCd=VA>). While these benchmarks are a guide for schools to follow, there are several factors that impact the cost of Internet. These factors include the location of the school division. If a school division or school buildings within a division are located in a rural area, the division may pay more for Internet service because provider cost to build fiber to these areas is higher. There may also be only one Internet service provider in the area and no competition from other providers to drive down costs.



**In 2017, only 29% of Virginia school divisions met the benchmark.**

Source: EducationSuperHighway

The chart above depicts the percentage of school divisions that meet the ESH affordability benchmarks. The benchmarks are updated based on a national analysis of connectivity data, and represents prices at different circuit speeds that were achieved by districts across the country in 2015. In Virginia in 2017 only 29% of divisions met this benchmark. The specific benchmarks are:

Internet Access Circuit Size	Price Benchmark (5/Mbps)
10 Gbps	\$0.75
1 Gbps	\$3.00
500 Mbps	\$5.50
200 Mbps	\$9.00
100 Mbps	\$12.00
50 Mbps	\$14.00

#### The top 5 school divisions in Virginia with the most affordable Internet access include:

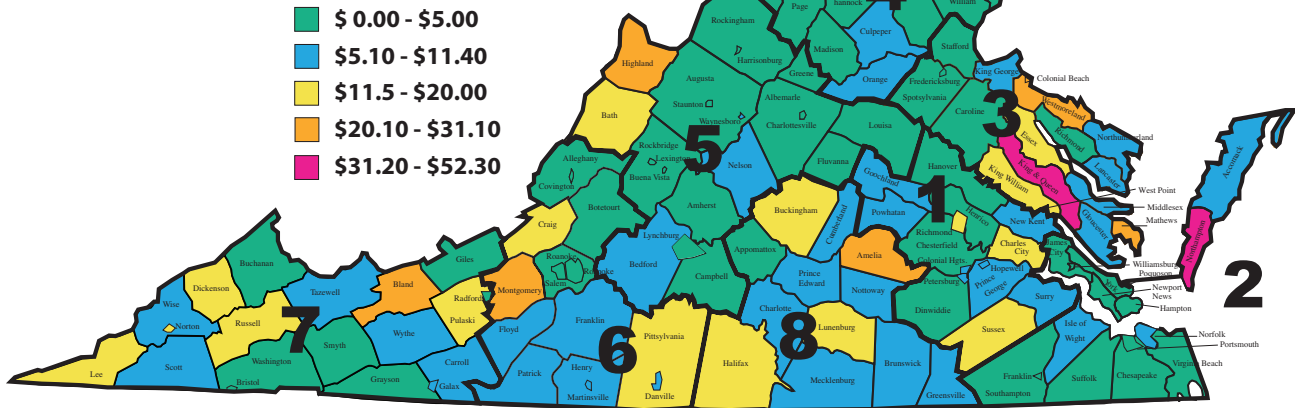
- \$0.45/Mbps:** Harrisonburg City Public Schools
- \$0.68/Mbps:** Rappahannock County Public Schools
- \$0.74/Mbps:** Roanoke City Public Schools
- \$0.75/Mbps:** Falls Church City Public Schools
- \$0.79/Mbps:** Campbell County Public Schools

Some school division technology directors reported why they are one of the five divisions with the most affordable Internet access. For example, one technology director stated:

*"We did our research and found out the cost at other school divisions and businesses in the surrounding county areas. Our provider had a cost greater than \$20 per Mbps with a 500 Mbps upload and download speed. With a forward vision, we contracted to have 48 strands of fiber placed in the county from our central office to our surrounding schools to upgrade our internet capabilities. We then re-negotiated with the provider for a 10 Gbps bandwidth upgrade which gave a more reasonable price for the service. Our contract is for 3 years with a re-negotiation clause after 2 years of service. There is a hidden cost of the fiber install but without the fiber, we could not have the bandwidth pricing."*

Another school division technology director reported that the reason for the low cost of Internet connectivity is because they are close to the service provider's Point of Presence (POP) and a long standing customer of the provider. Another reason for the low cost per megabit is because this school division purchased a combination of services including Internet, Wide Area Network (WAN) transport, and voice. For this division, purchasing a combination of services drove down pricing and made Internet access per month more affordable. Under the

## Cost per Megabit per Second (Mbps) for School Internet Access



E-rate program, another division is receiving the Lowest Corresponding Price (LCP) for 10 Gbps to all school locations within the division and 10 Gbps for Internet access. The per megabit price drops as bandwidth increases resulting in schools paying less for more bandwidth. Thus, economies of scale pay off for school divisions that purchase more bandwidth and get lower costs for it.

### Top 5 school divisions in Virginia with the least affordable Internet access:

**\$52.25/Mbps:** Northampton County Public Schools, *Eastern Shore of Virginia*

**\$50.00/Mbps:** King and Queen County Public Schools, *Gamewood Technology*

**\$31.12/Mbps:** Bland County Public Schools, *BVU Authority*

**\$29.44/Mbps:** Westmoreland Public Schools, *Metro Cast Cablevision*

**\$25.85/Mbps:** Mathews County Public Schools, *Metro Cast Cablevision and CenturyLink*

Some school divisions in Virginia pay more than other divisions in the state because of their geographical location. For example, one school division technology director reported that Metro Cast Cablevision was the only service provider that could provide an E-rate FCC Form 470 response for a bid that met the needs of their rural schools. Another rural school division technology director on the Northern Neck of Virginia reported that the only way they could get Internet access was through an established service provider in the area that had already installed fiber. Yet another division technology director reported that they do not have any affordable options pointing out that one service provider has cornered the market in their region of the state.

The map above shows the average cost per megabit per second access in Virginia school divisions. It captures that about half of the commonwealth school divisions are paying roughly the same rate for Internet access (e.g. the green area - less than 5 dollars per Mbps), while also showing where schools are paying much higher rates. If a school is paying more than its neighbors and fellow Planning District Committee members, savings may be possible, as there is likely similar infrastructure and availability. Also, schools in the orange or red grouping are paying very high prices and action to lower costs may be necessary. The breakdown is as follows:

66 school divisions or **50% - Green**

41 school divisions or **31.2% - Blue**

16 school divisions or **12.1% - Yellow**

7 school divisions or **5.3% - Orange**

2 school divisions or **1.5% - Red**

## Barriers To Connectivity

- School Wi-Fi networks are becoming increasingly complex and more demands are being placed on staff to manage the technology.**

School technology leaders were asked to identify the most significant barriers to increasing Internet connectivity in their division. Forty-nine divisions or 17% reported that additional division personnel were needed to support the network. Today's school technology staff are experiencing a significant increase in workload as a result of increased reliance on digital solutions. Continuous improvement and change within the network components and Wireless Local Area Network (WLAN) make it difficult to keep up and manage the network. The next most significant barrier to connectivity is a lack of competitive pricing for

Internet service because there are few service providers in the geographic area in which the division is located (44 divisions or 15%). Other reported barriers include the monthly recurring costs schools pay for Internet, and the capital/upfront, nonrecurring expenses. Nonrecurring costs are one-time costs such as fiber installation, and internal connections such as switches, routers, and Wireless Access Points (WAP). These barriers could prevent school divisions from supporting a reliable, secure, and stable network, and the myriad of digital resources available to support teaching and learning.

## Virginia Public School Authority (VPSA) Matching Funds for Special Construction

- *E-rate and VPSA funds combined save schools thousands of dollars over time on high-speed, scalable, fiber networks.*

In the Second *E-rate Modernization Order*, the FCC permitted schools and libraries to seek E-rate support for self-provisioning of their own high-speed broadband networks, or portions of networks, beginning in E-rate funding year 2016. Also, beginning in funding year 2016,

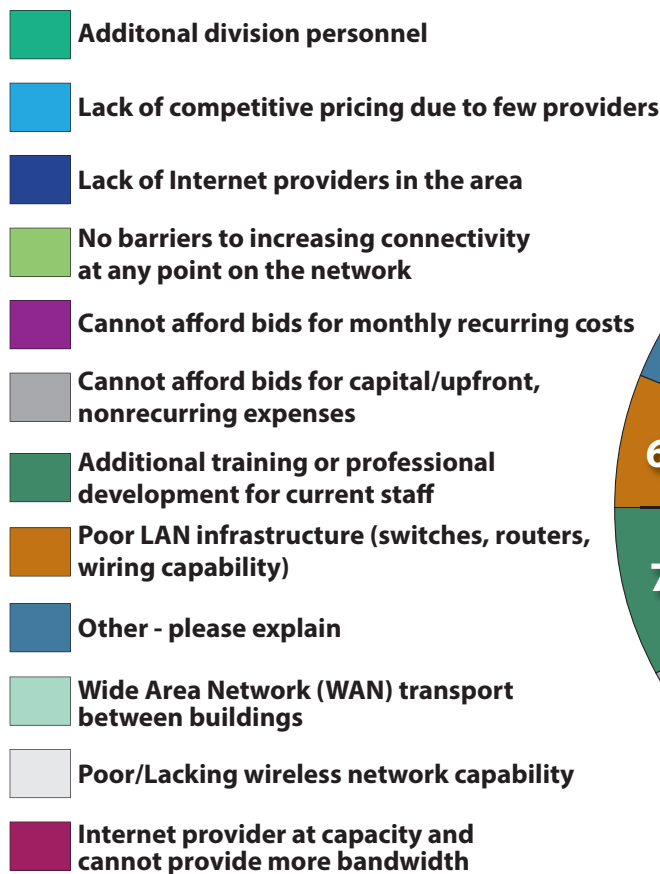
the E-rate program provided additional category one funding, up to 10 percent, to match state funding for special construction charges for high-speed broadband connections. These matching funds were intended to encourage states to address school and library connectivity gaps. The E-rate program will also match special construction funding when a state provides additional funding.

In 2016, Virginia approved the use of the VPSA funds as a state match for the special construction charges that schools incur when they build their own fiber network. These funds were traditionally used by school divisions to establish computer-based instructional and testing systems for the Standards of Learning (SOL) and to develop the capability for high-speed Internet connectivity at high schools followed by middle schools and elementary schools.

The E-rate Program increased an applicant's discount rate for special construction charges up to an additional ten percent to match the state funding on a one-to-one dollar basis.

According to the ESH, in 2016 and 2017, five school divisions received a total of \$771,393 in VPSA state matching funds for special construction. The five divisions that used both E-rate discounts and state matching funds were: Orange County Public Schools, Goochland County Public Schools, Albemarle County

## Barriers to Connectivity



Public Schools, Fredericksburg Public Schools and Louisa County Public Schools. These divisions had special construction projects approved by the Universal Services Administrative Company (USAC) for a total cost of \$5,719,793 for broadband investment in school divisions. This means for every \$1 of VPSA funds awarded, \$7 in broadband investment was returned back to Virginia, essentially a 7:1 return on investment of state funds. This 7:1 ratio means for every dollar the state funds for special construction, it gets back \$7 for its public schools.  
Source: EducationSuperHighway

Approximately 28,847 students attend these five school divisions. In addition, three divisions: Bath County Public Schools, King William County Public Schools, and Sussex County Public Schools, applied for a total of \$55,255 in state match funding for projects in 2018. These projects are still awaiting USAC review, for a total funding request of \$405,230. In summary, eight school divisions with a total of 32,722 students division wide were impacted by the state matching fund program. School divisions that constructed their own fiber networks were able to reduce the expense of these networks by using E-rate and VPSA funds and saved their divisions thousands of dollars while increasing the bandwidth needed to support digital learning.

## Sufficiency of Wi-Fi Connections

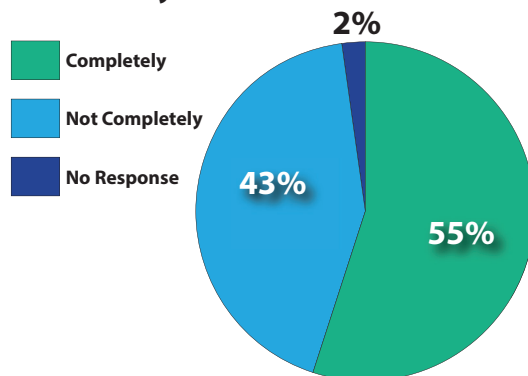
- *More work needs to be done in assisting school divisions with Wi-Fi networks*

School technology leaders were asked to rate the sufficiency of Wi-Fi connections in school buildings in the division. Because assessing Wi-Fi connectivity is subjective, each respondent's understanding of "sufficient" will differ to some extent, and division-to-division comparisons can be difficult because of how the network is designed in each school building.

If school division technology leaders selected that their Wi-Fi was not completely sufficient on the survey, they were then asked to describe the impact of the problem on the school building, grades, or students, and what they needed to solve the problem. The responses included adding more WAP's in areas where mobile computing had increased in the past 12 months, adapting the latest WAP standards, older school buildings with outdated infrastructure were a challenge in deploying Wi-Fi, and the need for more bandwidth.

Planning, procuring, and managing Wi-Fi networks constitutes some of the most complex and challenging responsibilities of a school division technology director.

## Sufficiency of Wi-Fi Connections



*Fifty-five percent or 73 divisions reported that Wi-Fi was completely "sufficient" while 43% or 57 divisions reported that Wi-Fi was Not Completely Sufficient.*

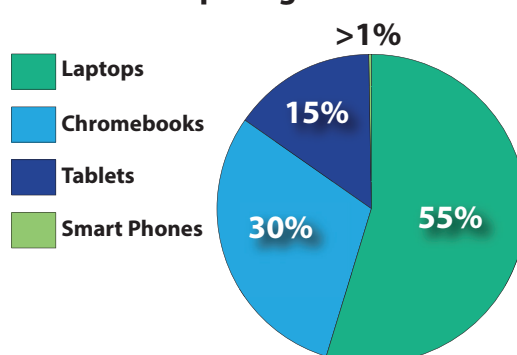
Fifty-five percent or 73 divisions reported that Wi-Fi was completely sufficient while 43% or 57 divisions reported that Wi-Fi was Not Completely Sufficient. More work needs to be done by VDOE to assist schools with Wi-Fi implementation since this technology continues to evolve and more mobile computing devices and other technologies are added to school networks.

## Number and Brand of Student Computing Devices

- *Schools are adding more mobile devices to support one-to-one computer device programs.*

Schools are deploying more computing devices such as Chromebooks, tablets, laptops, and other devices to access digital learning resources.

## Student Computing Devices



*There are 994,535 mobile computer devices in use across the 131 school divisions who responded to the survey question.*



There are 1.2 million students in Virginia’s public school system. There are 994,535 mobile computer devices in use across all of the 131 school divisions who responded to the survey question about the number and brand of computing device. This brings the total number of instructional devices available to students at, or approximately 0.8 devices per student. All 131 school divisions have close to one mobile computing device per student.

Within the Chromebook category, Hewlett-Packard (HP), Lenovo and Dell are the top choices, with 48, 36 and 34 divisions using Chromebooks manufactured by those brands. Google comes in fourth place with 10, with the remainder split between Acer, Asus, IBM, and Samsung.

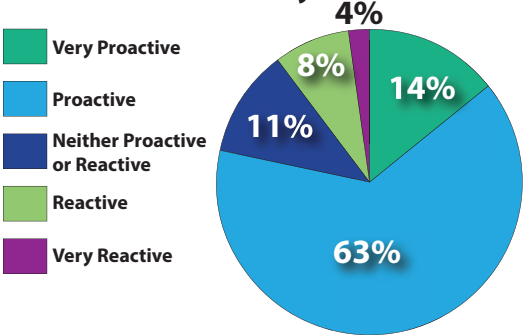
In the tablet computer category, Apple is the clear leader with 97 divisions using iPads. Dell is a distant second place with 11 divisions. Laptops are mostly split between Dell (65 divisions), HP (50 divisions), and Lenovo (22 divisions). And, for the divisions that provide students with Smartphones for learning, the Apple iPhone was the top choice.

In addition, 108 technology directors indicated that they planned to purchase additional computing devices in the 2018-2019 school year. These purchases are being made to support one-to-one computer device programs. By this measure, the demand for devices does not appear to be waning in the near-term. The more devices school divisions add to their network, the greater the need for an increase in bandwidth, WAP, network personnel and other internal broadband equipment to support the devices.

## Information Security

When school division technology directors were asked to rate their division on information security, 83 divisions or 63% rated themselves as being Proactive, while 19 divisions or 14% rated themselves as Very Proactive.

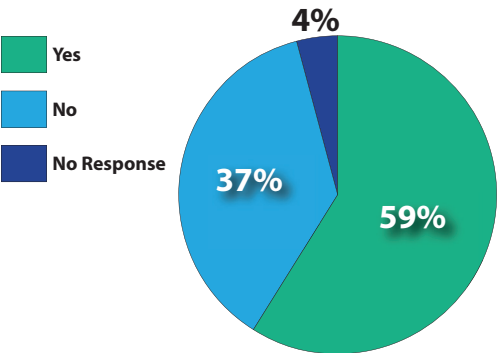
**School Division Rating on Information Security**



*When school division technology directors rated their division on information security, 83 divisions or 63% rated themselves as being Proactive.*

Seventy- eight divisions, or 59% have an information security policy approved by the Superintendent while 49 divisions or 37% said they do not have a network security policy.

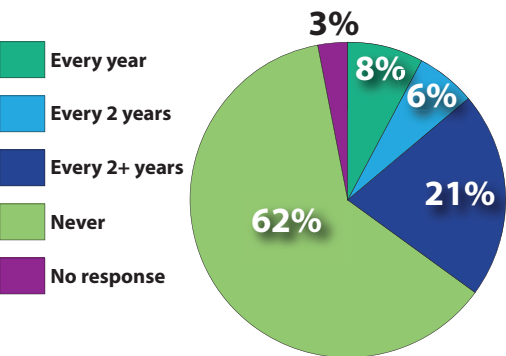
**Information Security Policy**



*Forty-nine, or 37%, school divisions reported not having an information security policy.*

School division technology leaders were asked how often they received an independent third party information security audit. Eighty-two divisions or 62% reported they had never had an audit, 11 divisions or 8% have an audit every year while 8 divisions or 6% have an audit every 2 years, 27 divisions or 21% have an audit every 2+ years.

**Third Party Security Audit**

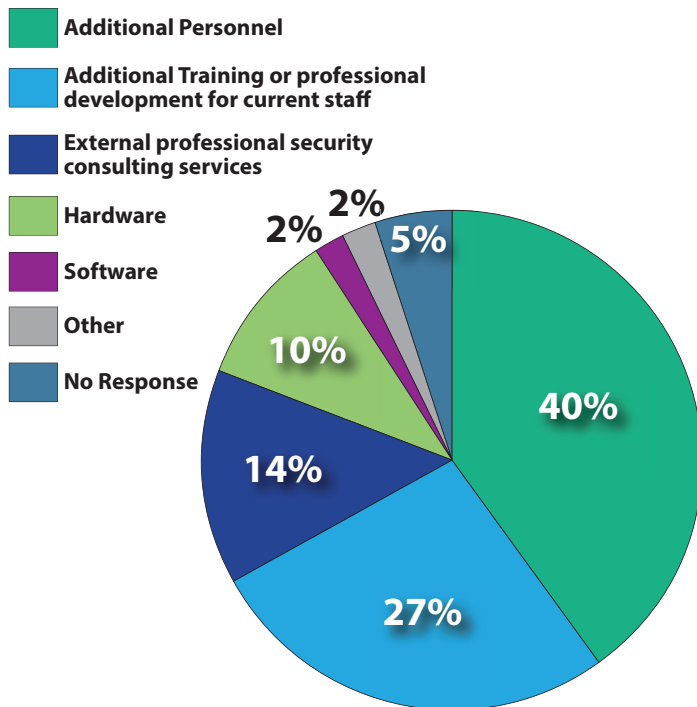


*Eighty-two divisions or 62% reported they had never had a third party audit.*

Respondents were asked what additional resources they would prioritize as the most important for information security. The findings show that 53 divisions or 40% need additional personnel to support information security, 35 divisions or 27% need additional training or professional development for current staff followed by external professional security consulting services at 14%.



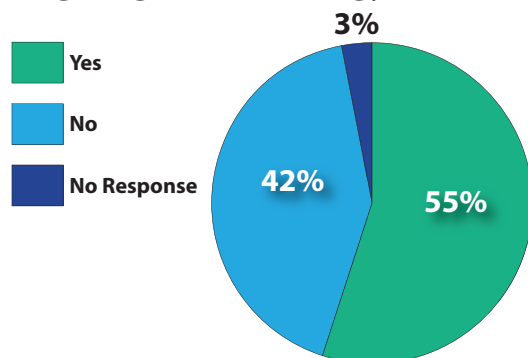
## Priority Resources Needed for Information Security



*Fifty-three divisions reported a need for additional personnel to support information security.*

The VDOE requested information from schools on the use of Single Sign On (SSO) technology. SSO refers to the technology for the user authentication process that allows access to multiple applications with one set of user credentials. Seventy-two divisions or 55% have a Single Sign on technology (SSO) in place while 56 school divisions or 42% do not.

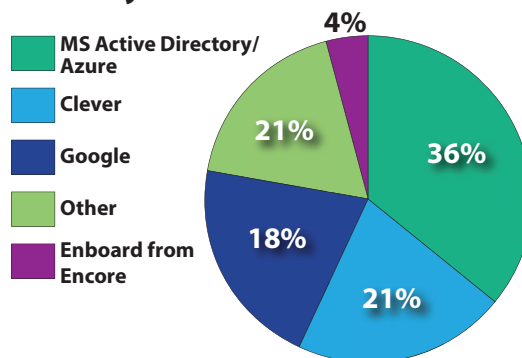
### Single Sign On Technology



*Seventy-two divisions or 55% have a Single Sign On technology (SSO) in place while 56 school divisions or 42% do not.*

If a school division technology director responded yes to the question about having an SSO strategy, they were then asked to name their primary SSO provider. The results indicate that Microsoft Active Directory/Azure was the most widely implemented SSO strategy followed by Clever, Google, Other, and Enboard.

## Primary SSO Providers

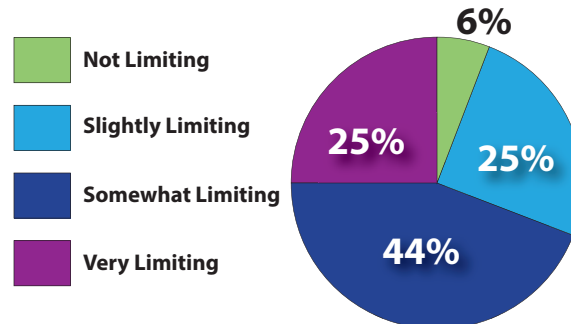


## Internet Outside of School

- *Closing the “Homework Gap” for students should be a state level priority.*

School technology leaders were asked to what extent a lack of access to outside-of-school Internet access is limiting your division’s teaching and learning. Thirty-three divisions or 25% indicated that the lack of Internet access outside of school is Very limiting, fifty-nine divisions responded that Internet outside of school is Somewhat limiting, thirty-two divisions said it was Slightly limiting, and eight divisions said that Internet outside of schools is Not at all limiting.

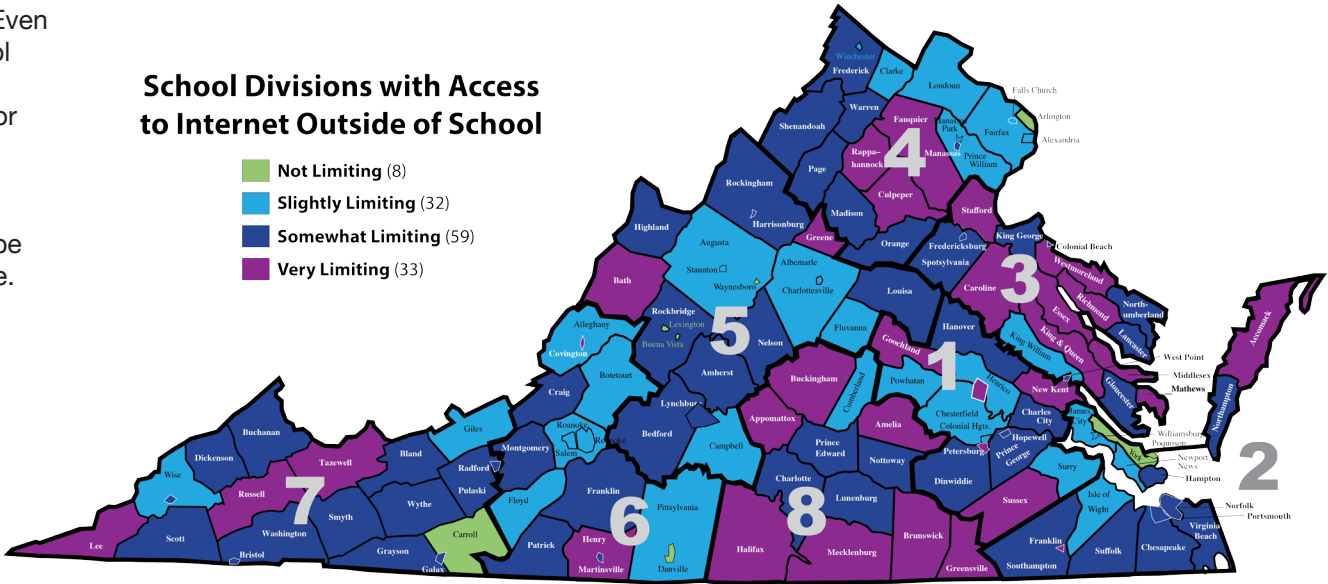
## Internet Outside of School



*A lack of access to Internet outside of school is still an issue for a large number of Virginia public school students.*

Divisions are rising to the challenge of home access to the Internet. The most common approaches to provide solutions are free/subsidized home Internet access for low-income families participating in service provider-sponsored services, working with the community and businesses to provide Wi-Fi hotspots for students, and deploying division-owned Wi-Fi hotspots for students. The diversity of approaches suggests that the VDOE may want to help divisions facing similar challenges, and elevate emerging practices to benefit all divisions. In addition, the 66 divisions that currently do not have a strategy or program may benefit from learning about how other school divisions are implementing Internet access outside of school. Even so, school division funding for Internet outside of school may not be affordable.

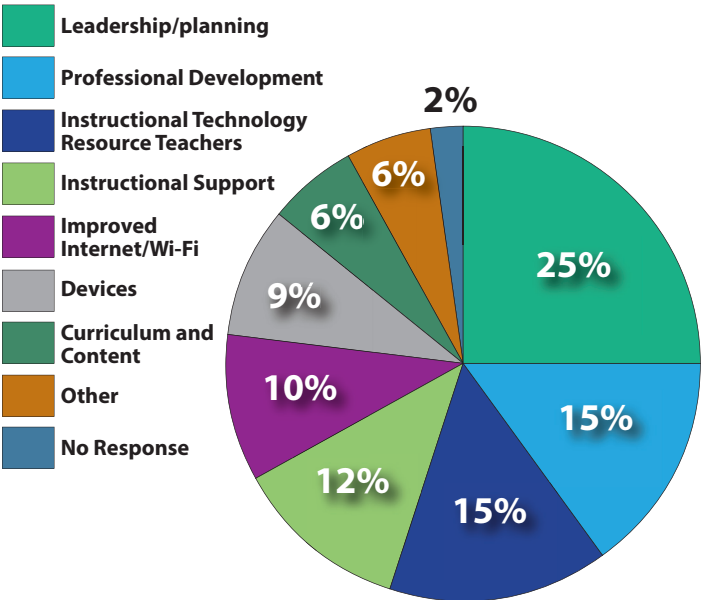
Additional data from the survey suggests that students primarily access the Internet and complete homework outside of school hours at home (65%). Twenty percent of students cannot access the Internet outside of school, 6% access the Internet at the public library, and 5% gain access to the school network after hours (e.g. high school library). In school divisions where one-to-one devices are taken home and Internet access is not available, some technology directors report student use of offline curriculum and instructional resources through Google Docs as a work around for lack of Internet.



## Support for Digital Learning

School divisions were asked about the most important resources needed to support digital learning. The results show that leadership/planning support was the most important resource needed to support digital learning followed by professional development for teachers, and the need for instructional technology resource teachers.

## Resources Needed to Support Digital Learning



## Conclusion

In conclusion, almost all public school buildings in Virginia are connected to fiber and 122 divisions of 132 are exceeding the minimum bandwidth goal of 100 kbps per student. There is significant variability in the bandwidth needs of school divisions and there are several factors involved in assessing how much bandwidth is sufficient to support digital learning. School divisions will continue to upgrade their bandwidth every year as more computing devices are added to the network. There will also be more demands on school technology staff to manage and support the network. Some school divisions have the capacity to support complex school networks while others do not. Information security is a priority for school technology leaders and the results show a need for additional personnel to support the security of the network. While Virginia public school divisions are in a good position to support digital learning, more work remains on addressing the affordability of broadband, Wi-Fi implementation, the “Homework Gap,” and information security.

## Recommendations

### Homework Gap

- *Closing the “Homework Gap” for students should be a state level priority.*
- *The Chief Broadband Advisor for the state should convene key stakeholders to work on the “Homework Gap.”*

### Broadband Data Collection Assistance

- *Policymakers should assist the VDOE in improving the data collection, analysis, and reporting, of the annual KLIP Broadband Connectivity Capability survey. Funding of this data collection is needed in order to meet the General Assembly directive that school divisions report to the VDOE by November 1 of each year, the status of broadband connectivity capability of schools in the division.*

### Affordability

- *To make Internet access more affordable for school divisions in rural areas and in geographical locations where there is only one service provider, the VDOE will collaborate with Internet service providers, the Chief Broadband Advisor, and other key stakeholders to drive down costs.*

### Network Engineering Expertise

- *To provide schools with additional expertise to support an ever expanding and complex Wi-Fi network, policymakers should assist VDOE by providing funding for a statewide contract, full-time resources, or consultant, to assist school divisions in need of network engineering, evaluation, validation, and information security expertise.*

# Glossary of Terms

## Bandwidth

In telecommunications, bandwidth is the width of a telecommunications channel. In digital communications, bandwidth is typically measured in bits per second (bps).

## Category One

Schools can apply for E-rate funding for category one services and includes Internet access and data transport between school facilities. Discounts are provided as a percent of total eligible project costs

## Category Two

Schools can apply for E-rate funding for internal connections/managed broadband services (Wi-Fi).

## EducationSuperHighway

The EducationSuperHighway is the leading nonprofit focused on upgrading the Internet access in every public school classroom in America. They believe that digital learning has the potential to provide all students with equal access to educational opportunity and that every school requires high-speed broadband to make that opportunity a reality. Their work focuses on catalyzing federal and state action on K-12 broadband initiatives and accelerating upgrades in school districts by connecting them to competitive service provider options.

## E-rate Modernization Order

The Federal Communications Commission (FCC) adopted the E-rate Modernization Order on July 11, 2014. The Order adopted in July takes major steps to modernize and streamline the schools and libraries universal service support program (more commonly known as the E-rate program) and focuses on expanding funding for Wi-Fi networks in elementary and secondary schools and libraries across America. Since its inception in 1997, the E-rate program has helped ensure that eligible schools and libraries have affordable access to the Internet. In modernizing the program, the Order seeks to ensure that the program is geared towards meeting the broadband needs of schools and libraries in today's world of interactive, individualized digital learning.

## Federal Communications Commission (FCC)

The FCC regulates interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia and U.S. territories. The FCC is an independent U.S. government agency overseen by Congress; the commission is the United States' primary authority for communications law, regulation and technological innovation.

## FCC Form 470

Posting of an applicant's FCC Form 470 (Description of Services Requested and Certification Form) opens the required competitive bidding process. After applicants certify an FCC Form 470 in the E-rate Productivity Center (EPC), it is posted publicly. Applicants can also issue a request for proposal (RFP) or related bidding document. Service providers can then review the posted FCC Form 470 information and submit bids.

## FCC Form 471

The services ordered and certification form is an FCC Form that schools and libraries use to report services ordered and discounts requested for those services. This Form contains information on the rural or urban status of schools, the schools in the division receiving the services, discount rate calculations, funding requests, product and service details, cost calculations, and connectivity questions related to bandwidth speeds, connection type, and the sufficiency of Wi-Fi.

## Gigabit per second (Gbps)

Gigabit per second (Gbps) is a unit of data transfer rate equal to: 1,000 megabits per second

## "Homework Gap"

Children that do not have high-speed Internet access outside of the classroom, and are not able to complete homework and after-school assignments. The "Homework Gap" leaves these children at a measurable disadvantage compared to their more affluent peers, resulting in lower test scores, lower grades, and ultimately, lower graduation rates.

## Information Security

Information security is the practice of preventing unauthorized access, use, disclosure, disruption, modification, inspection, recording or destruction of information. It is a general term that can be used regardless of the form the data may take (e.g., electronic, physical). Information security's primary focus is the balanced protection of the confidentiality, integrity and availability of data (also known as the CIA triad) while maintaining a focus on efficient policy implementation, all without hampering organization productivity.

## Information Technology Audit

An information technology audit, or information systems audit, is an examination of the management controls within an Information technology (IT) infrastructure. The evaluation of obtained evidence determines if the information systems are safeguarding assets, maintaining data integrity, and operating effectively to achieve the organization's



goals or objectives. These reviews may be performed in conjunction with a financial statement audit, internal audit, or other form of attestation engagement.

### **K-12 Learning Infrastructure Program (KLIP)**

Launched in 2015, Virginia's K-12 Learning Infrastructure Program (KLIP) is a partnership between the Office of the Governor, VDOE, and the EducationSuperHighway. KLIP supports increased access to affordable, high-speed Internet in every classroom in Virginia.

### **Lowest Corresponding Price**

The LCP is defined as the lowest price that a service provider charges to nonresidential customers who are similarly situated to a particular applicant (school, library, or consortium) for similar services. A similarly situated applicant is one that is located in the service provider's geographic service area." (CFR Part 54, Section 54.500).

### **Megabit per second (Mbps)**

Megabit per second (Mbps) is a unit of data transfer rate equal to 1,000 kbps

### **Point of Presence**

Point of presence (POP) is the point at which two or more different networks or communication devices build a connection with each other. POP mainly refers to an access point, location or facility that connects to and helps other devices establish a connection with the Internet.

### **Profile of a Virginia Graduate**

The Profile of a Virginia Graduate describes the knowledge, skills, experiences, and attributes that students must attain to be successful in college and/or the work force and to be "life ready."

### **Second E-rate Modernization Order**

The Federal Communications Commission (FCC) adopted the Second E-rate Modernization Order on December 11, 2014. The Order builds on actions taken by the Commission in July to modernize and streamline the schools and libraries universal service support program, known as the E-rate program. In this Order, the Commission aims to ensure that all schools and libraries have access to high-speed connectivity and increases the E-rate program spending cap to adequately support that connectivity. The actions taken in this Order are the critical next step toward meeting the program goals and connectivity targets the Commission adopted in July's E-rate Modernization Order.

### **Self-Provisioned Network**

Complete applicant ownership of a high-speed broadband network. The applicant hires a vendor to construct the network or a portion of the network, and thereafter owns and maintains that network or portion.

### **State Education Technology Directors Association (SETDA)**

The State Education Technology Directors Association (SETDA) is a 501(c) 3 not-for-profit membership association launched by state education agency leaders in 2001 to serve, support and represent their emerging interests and needs with respect to the use of technology for teaching, learning, and school operations.

### **Universal Service Administrative Company (USAC)**

The Universal Service Administrative Company (USAC) is an independent, not-for-profit corporation designated by the FCC to protect the integrity of universal service through informing and educating program audiences, collecting and distributing contributions, and ensuring program compliance. USAC administers the E-rate program, including operating the application process, reviewing applications, conducting audits, and providing technical support to state and district E-rate coordinators. Services are published annually in the "Eligible Services List".

### **Virginia Public School Authority (VPSA)**

VPSA distributes funds that E-Rate eligible schools can use as state match funding for special construction. Funds can be utilized to support infrastructure projects that will provide high-speed Internet access to eligible schools. The Virginia Department of Education is required to authorize allocations of \$72,660,000 to the VPSA for education technology grants for fiscal years 2017 and 2018.

### **Wireless Access Points (WAP)**

A wireless access point (WAP) is a hardware device or configured node on a local area network (LAN) that allows wireless capable devices and wired networks to connect through a wireless standard, including Wi-Fi or Bluetooth. WAPs feature radio transmitters and antennae, which facilitate connectivity between devices and the Internet or a network. A WAP is also known as a hotspot.



# Appendix A

## 2017 KLIP Survey Questions

**Q1. The information collected in this survey will be used by the DOE to better understand the Virginia public school technology landscape and determine opportunities for funding.** The results will be posted on the DOE website. You will receive a copy of your responses once you complete the survey.

There may be other staff in your division that will need to answer some of the questions related to digital learning. You may want to share the questions with them and solicit their response before you complete the survey. You can download and print the questions here: [\[GoogleDrive link\]](#)

One person in the division should complete the survey, which will take approximately 15 minutes to complete. Thank you for your time.

**Q2. Are each of the school buildings in your division connected to fiber?**

- ☐ Yes
- ☐ No

**Q3. Where schools are not on fiber, please include the school name and connection type they receive.**

*Non-fiber connection types may include DSL, cable modem, T1, T3, microwave/fixed wireless, and satellite.*

**Q4. Which answer best describes how your Internet is procured?**

- ☐ One Internet Service Provider @ISP© company supplies both Internet Access (IA) and the transport circuit from the ISP to the division
- ☐ One Internet Service Provider @ISP© company supplies Internet Access (IA) and a different ISP company supplies the transport circuit from the ISP to the division
- ☐ One Internet Service Provider @ISP© company supplies Internet Access (IA) only, while the transport circuit from the ISP to the district is owned by the division or municipality

**Q5. Please enter the name of the Internet Service Provider(s) (ISP) and the total Internet Access (IA) bandwidth supplied.**

*Please enter your answer in Megabit/second (Mbps). For a 3 Gbps connection enter 3,000.*

Internet Access (IA) and transport circuit to district  
Service Provider(s) Name Bandwidth (Mbps)

**Q6. Please enter the names of your Internet Service Providers (ISP) and bandwidth supplied for the Internet Access (IA) and transport services.**

*Please enter your answer in Megabit/second (Mbps). For a 3 Gbps connection enter 3,000.*

- ☐ One Internet Service Provider @ISP© company supplies both Internet Access (IA) and the transport circuit from the ISP to the division
- ☐ One Internet Service Provider @ISP© company supplies Internet Access (IA) and a different ISP company supplies the transport circuit from the ISP to the division
- ☐ One Internet Service Provider @ISP© company supplies Internet Access (IA) only, while the transport circuit from the ISP to the district is owned by the division or municipality

Service Provider Name Bandwidth (Mbps)

Internet Access (IA)

Transport from ISP to

Division

**Q7. Please enter the name of the Internet Service Provider(s) (ISP) and Internet Access (IA) bandwidth supplied.**

*Please enter your answer in Megabit/second (Mbps). For a 3 Gbps connection enter 3,000.*

Service Provider Name Bandwidth (Mbps)

Internet Access (IA)

**Q8. Which answer best describes your network architecture?**

- ☐ Internet enters at one location in the district and then is distributed to each school building by transport WAN
- ☐ Each school building is connected to the Internet by their own direct Internet circuit.
- ☐ There are no transport WAN circuits between the school buildings
- ☐ Other (please explain)

**Q9. Which answer best describes how the transport Wide Area Network (WAN) circuits between school campuses are procured?**

- ☐ The transport WAN circuits are leased from a service provider
- ☐ The transport WAN circuits are selfprovisioned and there is no monthly cost
- ☐ The transport WAN circuits are leased for some school buildings and owned by the division or municipality for other school buildings
- ☐ There are no transport WAN circuits between school buildings

**Q10. Have you sought an Internet upgrade in the last year, but been unable to afford the price you were quoted?**

- ☐ Yes
- ☐ No
- ☐ Other (please explain)

**Q11. Do you plan to upgrade your Internet access in the next 12 months?**

- ☐ Yes
- ☐ No

**Q12. Do you plan to upgrade your WAN in the next 12 months?**

- ☐ Yes
- ☐ No

**Q13. In the school buildings in your division with the poorest WiFi connectivity, please rate how sufficient the WiFi is for your daily needs.**

- ☐ Completely
- ☐ Mostly
- ☐ Sometimes
- ☐ Never
- ☐ Not Applicable

**Q14. You have selected that your WiFi is not completely sufficient. Please describe the impact of the problem (schools, grades or students affected), and what you would need to solve it.**

**Q15. What is the total number of classrooms in your division?** (including mobile units)

**Q16. What is the total number of WiFi Access Points (AP) that will be installed in your division's classrooms by September 1, 2017?**

*This includes APs currently installed and any APs that have been procured recently and will be installed this summer.*

**Q17. What are the most significant barriers to increasing connectivity in your school division? Please select all that apply.**

- ☐ Internet provider at capacity and cannot provide more bandwidth
- ☐ Lack of Internet providers in the area
- ☐ Lack of competitive pricing due to few providers
- ☐ Transport connection type is at capacity and must be replaced (e.g we have copper vs. fiber connections)
- ☐ Cannot afford bids for capital/upfront, nonrecurring expenses
- ☐ Cannot afford bids for the monthly recurring costs
- ☐ Wide Area Network (WAN) transport between buildings
- ☐ Poor/lacking wireless network capability
- ☐ Poor LAN infrastructure (switches, routers, wiring) capability
- ☐ Additional division personal
- ☐ Additional training or professional development for current staff
- ☐ External professional technical/consulting services
- ☐ No barriers to increasing connectivity at any point on the network
- ☐ Other (please explain)

**Q18. By September 1<sup>st</sup> 2017 what devices will your division provide for use by Students?**

	Apple	HP	Lenovo	Google	IBM	Other
Chromebooks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tablets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laptops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smart Phones	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q19. If other, please indicate the manufacturer. For example ® Dell Chromebooks; Asus Laptops.®**

**Q20. Approximately how many of each device will be in use in your division by September 1, 2017?**

- ☐ Number of devices
- ☐ Chromebooks
- ☐ Tablets
- ☐ Laptops
- ☐ Smart Phones

**Q21. Are you planning on buying additional devices in the next 12 months?**

- ☐ Yes
- ☐ No

**Q22. If yes, approximately how many devices do you plan to purchase in the next 12 months?**

*Example 50 ® Dell Chrombooks.®*

**Q23. Indicate which of the following practices for student learning your division follows (check all that apply)**

	Available	Actively planning to implement	In division's vision/strategic plan	Not currently a Priority
Blended learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personalized learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mastery based learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Project based learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anywhere, anytime learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distance education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digital citizenship	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
College & career readiness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1:1 based learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open Educational Resources (OER)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q24. If you indicated 1:1 based learning is available or in your division's vision, please indicate the scope of your implementation**

- ☐ Divisionwide
- ☐ Schoolwide
- ☐ Grade level
- ☐ Program based



**Q25. What are the most important resources you need to support digital learning in your school division? Drag and drop this list to order from 1 (most important) to 8 (least important)**

- ☐ Instructional support
- ☐ Instructional Technology Resource Teachers
- ☐ Professional development
- ☐ Devices
- ☐ Digital curriculum and content
- ☐ Improved Internet/WiFi connectivity
- ☐ Leadership/planning support
- ☐ Other (please explain)

**Q26. Do you have a network security policy approved by the superintendent?**

- ☐ Yes
- ☐ No

**Q27. How would you rate your division on network security?**

- ☐ Very proactive
- ☐ Proactive
- ☐ Neither proactive nor reactive
- ☐ Reactive
- ☐ Very reactive
- ☐ Don't know

**Q28. How often does your division receive an independent third party network security audit?**

- ☐ Every year
- ☐ Every 2 years
- ☐ Every 2+ years
- ☐ Never had an audit

**Q29. What additional resources would you prioritize as important for network security? Drag and drop this list to order from 1 (most important) to 6 (least important)**

- ☐ External professional security consulting services
- ☐ Additional Personnel
- ☐ Additional training or professional development for current staff
- ☐ Hardware
- ☐ Software

**Q30. Does your school division have a SingleSign On (SSO) strategy at the division level that authenticates teachers, administrators, students, parents, and other support personnel against applications?**

- ☐ Yes
- ☐ No

**Q31. If yes, who is your primary SSO provider?**

- ☐ Clever
- ☐ Enboard from Encore
- ☐ Google
- ☐ MS Active Directory/Azure
- ☐ School Messenger

**Q32. To the best of your knowledge, where do students primarily access the Internet and complete homework outside of school hours?**

- ☐ Percentage of student body
- ☐ At home
- ☐ Public library
- ☐ Cannot access the Internet out of school
- ☐ After hours school network
- ☐ Other

**Q33. To what extent is a lack of access to outside of school Internet access limiting your division's teaching and learning?**

- ☐ Very limiting
- ☐ Somewhat limiting
- ☐ Slightly limiting
- ☐ Not at all limiting

**Q34. Which, if any, of the following are among your division's strategies for increasing access outside of school hours? Select all that apply**

- ☐ Currently do not have a strategy or program
- ☐ Free/subsidized home access for low-income families
- ☐ Provide free/subsidized division sponsored wireless access to homes and the community
- ☐ Promote Lifeline program
- ☐ Participate in provider sponsored services
- ☐ Work with the community/businesses to provide WiFi hot spots for students
- ☐ Deploy division-owned WiFi hotspots for students
- ☐ Provide filtered Smart Phones
- ☐ Provide loaner hot spots
- ☐ Other (please explain)

**Q35. What are some of the things that you are excited to see taking place in the classroom that you'd like state leaders to know about?**

If you wish to share any narrative related to your division's use of technology to advance student learning, please do include any highlights, links, etc.

**Q36. This is the final question. Anything else you'd like to share?**

**Q37. You're done!**

You will be emailed a copy of your responses shortly. Thank you for your time.

# Appendix B

## SETDA E-rate Document



### WHAT IS E-RATE?

The [Federal Communication Commission's \(FCC\) Universal Service for Schools and Libraries Program](#) (often referred to as E-rate) is one of four such Universal Service Fund (USF) programs. Funding for E-rate comes from USF fees collected by telecommunications providers. Known as a “discount” program, E-rate provides schools and libraries with subsidies on telecommunications and Internet access services based on their level of need. The discount can range between 20 and 90 percent and is based on the percentage of local students qualifying for free or reduced lunch under the National School Lunch Program (NSLP). Schools and libraries can research their E-rate eligibility at <http://www.usac.org/sl/>. The program is currently capped at \$3.9 billion. Additionally, it should be noted that specifically defined public libraries are eligible for discounts on E-rate eligible services.

Authorized under the Telecommunications Act of 1996, E-rate's authors focused the program on connecting all schools and libraries to the Internet. Since the FCC's 2014 E-rate modernization orders, the E-rate's goal is to ensure that all schools and libraries have ample bandwidth to meet the educational needs of students and library patrons. To accomplish this goal, E-rate provides public and private schools and public libraries with support for:

**Category One:** Data Transmission Services and Internet Access (Broadband). Category One services include internet access and data transport between school facilities. Discounts are provided as a percent of total eligible project costs.

**Category Two:** Internal Connections/Managed Internal Broadband Services (Wi-Fi). Category Two services includes internal connections (Wi-Fi) within a school. Discount maximums are determined by school enrollment and poverty level.

### How is the program implemented?

The [Universal Service Administrative Company \(USAC\)](#) is an independent, not-for-profit corporation designated by the FCC to protect the integrity of universal service through informing and educating program audiences, collecting and distributing contributions, and ensuring program compliance. USAC administers the E-rate program, including operating the application process, reviewing applications, conducting audits, and providing technical support to state and district E-rate coordinators. Services are published annually in the [“Eligible Services List.”](#)

### How do I apply for E-rate discounts?

The E-rate application process is quite involved and is an ongoing process throughout the year. An eligible applicant must complete four distinct and dependent stages of the application process:

- 1. Competitive Bidding:** Procurement/Bidding of the eligible services through a fair and open “Competitive Bidding” Process. Following State Bid Laws and E-rate rules the applicant must choose the most cost effective solution for meeting their needs. (FCC Form 470)
- 2. Applying for Discounts:** Once an applicant determines the most cost effective solution and the resulting service provider, the applicant must file an application describing the services to be ordered, certifying the discount rate and other certifications required by E-rate program rules. (FCC Form 471)

3. **Starting Services:** Upon the review processes performed by the E-rate application reviewers, applications are either awarded or denied the requested discounted services. In the event they are awarded the requested discounts, the applicant must confirm the services' start date and make further certifications such as [CIPA compliance](#). This opens the invoicing process. (FCC Form 486)
4. **Invoicing:** Applicants may receive their awarded discounts through discounts provided by the awarded Service Provider's bill(s) to the applicant or the applicant may choose to pay the bill in full and then file to get their discounts reimbursed.

### Key Information

- E-rate is a reimbursement program; it is not a grant program.
- The E-rate application process is on-going throughout the year.
- Reimbursement and/or discounts are dependent on approval.
- The program allows discounted billing or reimbursement as payment options.
- E-rate applicants are responsible for paying the "non-discounted share" and keeping application documentation.

### Responsible Party

- As an applicant of E-rate, districts are responsible for the non-discounted share of costs related to the services.
- As part of the application process, the primary school district lead must certify: "I certify, as executive officer, that the entity I represent has budgeted and secured access to all of the financial resources necessary to pay its share of the full amount of the services, should E-rate ever be denied or discontinued."

### General Timeline

- **Fall:** Procurement (470)
  - **Winter:** 471 Application Due
  - **Spring:** Application Review (471)
  - **Summer:** Funding Commitments (486) Services Begin July 1
- \*\*Process is dependent on state and local procurement requirements.**

**For more details on the application process:** [USAC E-rate Flow Chart](#)

To stay most up to date on the E-rate visit: <http://fcc.gov/E-rate-update>.

### Background

This document was developed by SETDA's E-rate Special Interest Group.



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